regarding these birds it is impossible to make any generalizations of importance; and I will leave the subject for a special paper on the order.

It is not until the different conditions of the carotid vessels are taken in connexion with the pterylosis, as well as the anatomy of the viscera and muscles, that a correct idea can be formed as to their true value in the classification of birds. The work of the illustrious Nitzsch assists much in this direction; and it is to be hoped that as facts become more numerous, ornithologists will realize that a correct arrangement will not be arrived at until anatomy is more thoroughly studied.

In conclusion, I have to present my best thanks to Mr. Sclater for the kind way in which he has on all occasions throughout this inquiry assisted me with suggestions and advice—also to Prof. Flower, Mr. O. Salvin, Mr. Sharpe, and Mr. Howard Saunders, for their so willingly putting at my disposal specimens in spirit of species which I should not otherwise have had the opportunity of examining.

May 20, 1873.

Dr. E. Hamilton, V.P., in the Chair.

Lord Arthur Russell, M.P., F.Z.S., exhibited a very young specimen of the scaleless variety of the Common Carp. He said that, like all animals that are bred in captivity, carp are apt to vary in form and colour. In Germany, where much attention is given to fish-ponds on all large estates, the varieties of the carp are more numerous than in other countries, and have been described by Bloch, Heckel, and other ichthyologists as distinct species. One of the most remarkable of the constant varieties of the carp was the one known as "Spiegelkarpfen" (*Cyprinus rex, cyprinorum, specularis* sive *macrolepidotus*). In this variety, which is exceedingly fine, the scales only persist along the line of the back and on the sides of the fish in two or three irregular rows. These few remaining scales attain a great development; the rest of the body is naked. Specimens in which the scales only remain along the dorsal line go by the name of Saddle-carp among German fishermen. Occasionally the scales are wanting altogether, and the Carp is covered with a leathery skin, and is popularly called "Lederkarpfen" or Leather-carp. This variety has been described as a distinct species (*C. nudus* and *C. coriaceus*), and is named by Agassiz *Cyp. alepidotus*. Heckel ('Austrian Ichthyology,' p. 58) and other authors believe the total loss of scales to be an effect of age on single specimens of the Spiegel-carp variety in which the number of scales was already reduced to a minimum; and the only interest of the little specimen Lord A. Russell had brought with him was that it showed *C. nudus* to be a constant variety, without scales from its birth. All these varieties are considered better for the table than the common Carp, and command a higher price in the German fish-market. The

specimen before the Meeting he owed to the kindness of Dr. Peters: it came, with others now in the Museum at Berlin, from the ponds of Count Frankenberg in Silesia.

These naked Carp are looked upon by German fishermen as hybrids of the Carp and Tench, hence the popular name of Schleihkarpfen in some districts.

Several living Spiegelkarp had been sent home from Berlin this year by Lord Odo Russell, and were now thriving in a pond at Woburn Abbey in Bedfordshire.

Dr. E. Hamilton, referring to the question of the great fecundity of *Hydropotes inermis*, read the following extract from a letter received from Shanghai, and dated April 3, 1873, upon this subject:—"I have been unable yet to procure a live Deer (*Hydropotes*), but have put beyond doubt that they have a great number of young at a birth. A female was shot near Taitsan, at the end of February; and on cutting her open seven young ones were found. They were placed in spirits; and I have carefully examined them. So far advanced are they that you can plainly distinguish their feet and eyes."

Mr. H. E. Dresser, F.Z.S., exhibited and made remarks on some rare birds from the Ural, amongst which were the Smew (*Mergus albellus*) in down, nestlings of the Rustic Bunting (*Emberiza rustica*), and several specimens of the bird described by Lilljeborg as *Salicaria magnirostris*, which last he believed to be identical with *Acrocephalus dumetorum*, Blyth, from India, as seemed to result from the comparison of Indian examples.

Mr. Sclater gave an account of the Gardens of some of the Zoological Societies on the continent, which he had visited during the past fortnight, and spoke of the principal novelties he had seen in them.

At Antwerp the series of Antelopes was, as usual, very fine, and embraced examples of the West-African form of the Blau-bok (*Hippotragus leucophæus*), and pairs of the Bubaline Antelope (*Alcelaphus bubalis*) and Sing-sing (*Cervicapra sing-sing*). Amongst the Phasianidæ were a pair of *Argus giganteus*, the female of which had deposited her first egg on the day of Mr. Sclater's visit (May 8th). The female Giraffe (*Camelopardalis giraffa*) obtained from this Society in 1866 had born two young ones, a female born June 10th, 1871, and another female born March 15, 1872. Both these and the parents were in excellent health and condition.

In the Rotterdam Gardens the most remarkable animal observed was a fine specimen of *Cryptoprocta ferox*, obtained from Hr. Van Dam, and probably the only specimen of this rare Madagascarian animal ever brought alive to Europe. Although in general external appearance more like a *Viverra* of some sort, it certainly exhibited cat-like actions, and was especially remarkable for its long rounded tail. A second rarity was a specimen of the Papuan Cassowary lately referred to and figured in the Society's 'Proceedings' (1872, p. 147,

pl. ix.) as *Casuarius kaupi* from the example still living in the Gardens. Of a pair of Lemurs which had bred together the male was of the form called *Lemur collaris* by Geoffroy, and the female of the form usually called *L. albifrons*, just as in the instance spoken of (P. Z. S. 1871, p. 230). The offspring (a female) more nearly resembled the mother. This Mr. Sclater considered was of importance, as giving further evidence of the truth of his theory that these forms were ♂ and ♀ of the same species.

In the Gardens of the Society "Natura Artis Magistra" of Amsterdam, under the care of Mr. G. F. Westerman, the series of representatives of the genera *Equus* and *Bos* and of the Crane-family (Gruidæ) were especially remarkable for their extent and perfection. Other rarities were a female of the Sable Antelope (*Hippotragus niger*) and a Tree-Kangaroo (*Dendrolagus*).

In the Garden of the Zoological Society of Hamburg the female Sumatran Rhinoceros (*Rhinoceros sumatrensis*) obtained about the same time as that formerly in this Society's Gardens* was one of the principal animals. Other rarities were a pair of *Gazella rufifrons*, recently received from West Africa, a male Water-buck (*Cervicapra ellipsiprymna*), the only living example of this fine Antelope that had occurred to Mr. Sclater, a male Koodoo (*Strepsiceros kudu*), and, amongst the birds, specimens of *Didunculus strigirostris* and *Coracopsis comorensis*.

The Zoological Gardens of Berlin had attained great development under the new organization introduced four years ago. Many fine new buildings had been erected, amongst which those devoted to the Feline Carnivora and the Antelopes were probably the most complete and best adapted to their purpose of any in existence.

The following papers were read:—

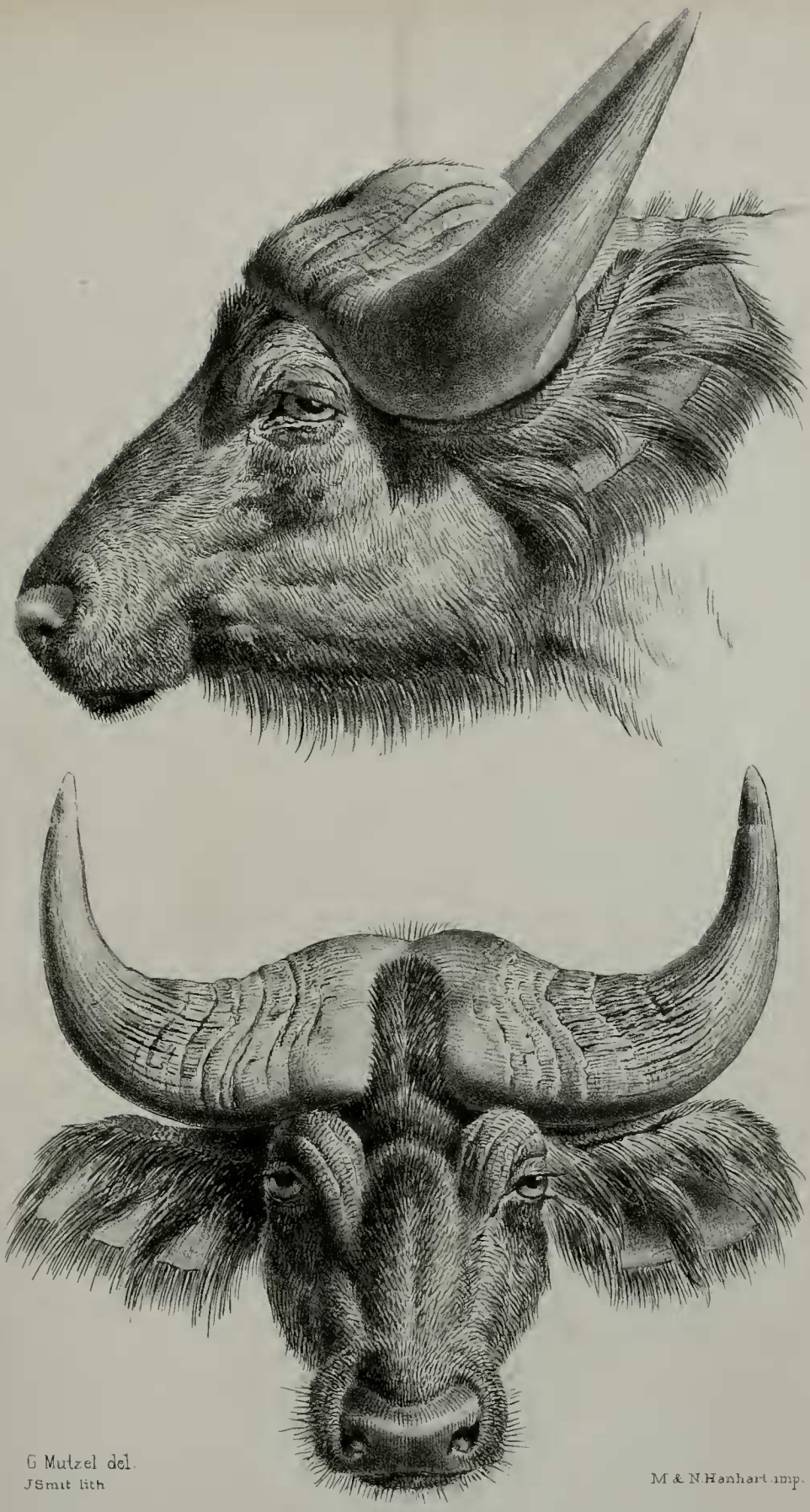
1. On African Buffaloes. By Sir Victor Brooke, Bart., F.Z.S.

[Received March 18, 1873.]

(Plate XLII.)

In the early part of last year I received from Mr. Edward Gerrard the skull and horns of a small but adult Buffalo (figs. 1 & 2), which interested me exceedingly, as it differed in a striking manner from any thing I had at that time seen, with the exception of one specimen in the British Museum. As Mr. Gerrard was unable to give me any reliable information respecting this skull, I was induced to investigate the history of the specimen somewhat resembling it in the British Museum, in order to discover, if possible, the exact locality from which the latter had been originally obtained. Although the result arrived at was not so definite as I could have desired, some facts bearing upon the subject of this paper were brought to light

* See remarks, P. Z. S. 1872, p. 790.



G Mutzel del.
J Smit lith

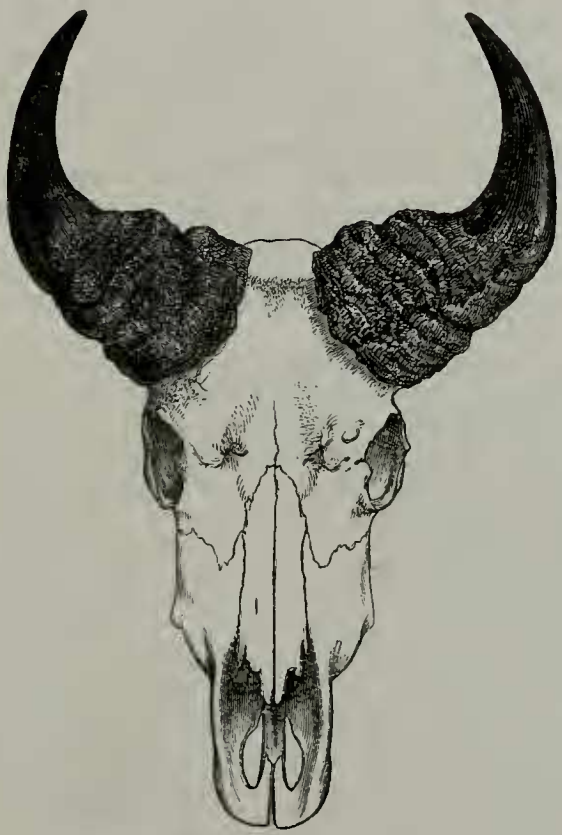
M & N Hanhart imp.

HEAD OF BUBALUS PUMILUS.

(from male in Zool. Gard Berlin)

which render it necessary for me to give here a short account of the history of the specimen in the British Museum.

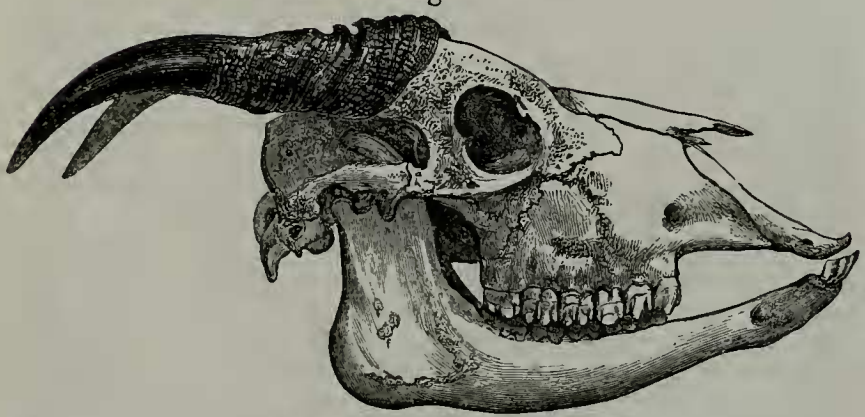
Fig. 1.



$\frac{1}{6}$

Head of Buffalo obtained from Mr. E. Gerrard (front view).

Fig. 2.



Head of Buffalo obtained from Mr. E. Gerrard (side view).

In 1686 Grew, in his work on the "Rarities belonging to the Royal Society, and preserved at Gresham College," describes (p. 26) in the following words a specimen at that time contained in the collection of the Society :—"The horns of a wild Bull . . . . . They are broad at the roots, but grow very sharp of a sudden, and bended inwards about the middle, so that the tips are not more than two inches distant. See the animal described by Belon and others." On turning to Belon's 'Travels in Asia, Arabia, and Egypt,' published in 1555, I find that at pages 119, 120, he figures and describes a small species of Buffalo, which he calls the "*Petit Bœuf d'Afrique*." He describes the animal as "about the size of the Stag, having the horns notched like those of the Gazelle and raised upon the frontal bones." Belon states that the specimen examined by him was brought from Asamie (probably Azamor of modern maps) a province in Morocco.

Pennant in his 'Synopsis' (1771), in plate 8, fig. 3, figures, and at page 9 describes, the specimen which had been described by Grew, as above quoted, nearly a century before, and which was then still preserved in the Royal Society's collection. Both Grew and Pennant appear to have considered this specimen certainly identical with that described by Belon; but although I think this probable, I have discovered nothing in Belon's writings to enable me to trace the specimen described by him into the possession of the Royal Society. In his 'Quadrupeds,' published some years later, Pennant gives the same figure (which appeared first in his 'Synopsis'), and describes the species under the name of the "Dwarf Buffalo." In Turton's translation of the 'Systema Naturæ' (1806) the same specimen is again mentioned (p. 121) and the specific name *pumilus* conferred on the species. In 1852 Dr. Gray (Cat. Mamm. Brit. Mus.) again figured this old and remarkable specimen, which had passed with the rest of the collection of the Royal Society, in 1780, from Crane Court into the British Museum; but in the text (p. 28) Dr. Gray expressed his opinion that the specimen represented the young of *Bubalus caffer*, and placed former references to it under the synonyms of that species. In the 'Proceedings' of this Society for 1863, at p. 157, Mr. Blyth, in a paper on African Buffaloes, figures once more this specimen, and, convinced of its specific distinction, but unaware of Turton's previous name, proposes for it that of *reclinis*. Dr. Gray, in his last Catalogue of the Ruminants in the British Museum (1872), recognizes the specific distinction, and adopts Mr. Blyth's name *reclinis*. It may be well for me to add that a comparison of the drawings given by Dr. Gray and Mr. Blyth with that given by Pennant, and of these with the original specimen in the British Museum (which is composed of the frontal bones and horns), renders the identity of the specimen, of whose history I have here given an abstract, clear and certain. It was, then, with no small satisfaction that I perceived in my own specimen (obtained, as before stated, from Mr. Gerrard) an example of the mysterious species which had been, as I then believed, for three centuries represented solely by the Royal Society's old specimen; and ac-

cordingly, thinking the matter to be of considerable interest, I commenced a paper in which I intended to lay before the Society the facts as they then appeared to me. Fortunately, however, before sending in my communication, I determined to take advantage of any new light which might possibly be thrown upon the subject during a visit to some of the principal continental museums. The observations consequent upon this visit may be conveniently grouped under two heads.

First. As to the identity of the *Bos pumilus* of Turton with the *Bubalus brachyceros* of Gray.

Second. Upon the possible identity of the smaller species of Buffalo of Eastern Africa mentioned by Heuglin and others with *Bubalus pumilus*.

First, as regards the identity of *Bos pumilus* of Turton with the *Bubalus brachyceros* of Gray.

In the magnificent Museum at Leiden are preserved the perfect skulls and horns of two Buffaloes, originally brought from the coast of Guinea by Pel. These specimens are beautifully figured in the 'Bijdragen tot de Dierkunde' (i. p. 33), and in the article accompanying the plates, as also in the Leiden Museum, are referred to the *Bubalus brachyceros* of Gray. It was therefore with very considerable astonishment that I found the Dutch specimens, in their much larger, more flattened, and more corrugated horns, to differ in a striking manner from the types of Dr. Gray's *Bubalus brachyceros*; whilst, on the other hand, in these characters they presented a strong resemblance to the old specimen, the history of which I have above given, and to the specimen in my own collection.

At first this discovery puzzled me exceedingly; but subsequent investigation has led me to what I believe to be true solution of the difficulty, viz. that notwithstanding the, at first sight, remarkable contrast between Pel's specimens and those upon which Dr. Gray founded the species *Bubalus brachyceros*, they in reality belong but to one species, the former representing the male, the latter the female. The name *Bubalus brachyceros* was first published by Dr. Gray in the 'Magazine of Natural History' for 1837 (p. 587), in a notice of two buffalo-heads obtained by Captain Clapperton in Central Africa (figure 3), and presented to the British Museum. In 1839 (Ann. Mag. Nat. Hist. p. 284) Dr. Gray amplified his former notice of the species by some observations founded on a living female Buffalo which Mr. Cross of the Surrey Zoological Gardens had just received from Sierra Leone. In this paper Dr. Gray dwells upon the close points of resemblance between the Sierra Leone specimen and those brought from Central Africa by Captain Clapperton: it may therefore be well to remark in passing that the country from which Pel's specimens were obtained lies intermediate to the countries which afforded the specimens upon which Dr. Gray's remarks were founded. Taken in connexion with this remark I find in the British Museum three specimens which, so far as my judgment serves me, appear to decide the matter. These specimens were obtained by Dr. Baikie during the Niger expedi-

tion. They represent an old male and two females. The former was presented to the Museum by Dr. Baikie; the two latter were purchased from his collection. Unfortunately there is no exact locality attached to any of these specimens; but from the very slight

Fig. 3.

$\frac{1}{10}$

Head of *Bubalus*, ♀, brought by Capt. Clapperton from Central Africa. One of the types of *B. brachyceros* (Gray).

interest which Dr. Baikie appears to have taken in natural history, there can be little doubt that they were obtained somewhere along the course of the Niger, and that they represent the Buffalo of the countries through which he passed. In the head which I consider to be that of the male the horny sheaths are lost; but the very flattened compressed character of the horn-cores shows decidedly that the horns resembled closely those exhibited in Pel's specimens. In the specimens which I attribute to the female the horns are present, and, with the exception of one particular, which I shall mention presently, resemble so closely Captain Clapperton's specimens that I have no doubt whatever but they belong to the same species. This character consists in the points of the horns of the older of Dr. Baikie's females being turned suddenly, and pointed backwards in a manner exhibited very slightly in either of Captain Clapperton's specimens. In the younger female from the Niger this character is absent. But, remarkable as it may appear, a similar variation is observable in the two specimens in the Leiden Museum. That figured on the first plate in the work above referred to represents the specimen in which the points of the horns are turned boldly backwards and reclined, in a manner precisely similar to that shown by the specimen now before the Society (figs. 1 & 2);

whilst the head represented on the second plate presents scarcely any trace of this remarkable character; and yet the agreement of the skulls in all particulars precludes the idea of this solitary character representing specific distinction. As a further illustration of the inconstancy of this character, I may mention that Mr. Blyth lately observed at Mr. Jamrach's establishment (from which place Mr. Gerrard obtained the skull and horns in my possession) the skull and horns of a Buffalo, which in all particulars most closely resembled the last mentioned of Pel's specimens. Mr. Blyth, however, notwithstanding numerous superficial differences, perceived immediately that this very beautiful specimen, which is now in the British Museum, represented his *Bubalus reclinis*, and referred it without hesitation to that species.

The fact of Dr. Baikie's specimens presenting the characters which appear at first sight to separate the *Bubalus brachyceros* of Gray from that species as represented in the Leiden Museum, taken in connexion with the fact that these as well as Pel's specimens were procured in countries intermediate to those which afforded the subjects of Dr. Gray's descriptions of the species, offers strong reasons for the conviction above expressed—namely, that these differences are but sexual. We see, moreover, that any characters of difference presented by Pel's specimens as compared with the type of *Bubalus pumilus* are bridged over by the intermediate character of the specimen this evening exhibited. Thus a very reasonable probability is obtained that the *Bos pumilus* of Turton and the *Bubalus brachyceros* of Gray represent but one species—the former the male, the latter the female.

But we have, I think, still further corroboration of this opinion in the remarks and plates given by M. Du Chaillu in his work on Equatorial Africa (1861). At p. 175 M. Du Chaillu figures and describes the male of the "*Niaré* or Wild Bull" of Equatorial Africa. Both M. Du Chaillu's figure and his description of the horns are so applicable to the specimen on the table (figs. 1 & 2) that one could readily believe it had formed the subject of M. Du Chaillu's figure. Two more plates (pp. 125 & 204) are given in the same work; and in both these the horns are represented as at p. 175. I think it therefore probable that these plates were taken from one specimen, that specimen exhibiting in an extreme a character which I have shown above to be most inconstant. Dr. Gray, in 1861, in the 'Annals and Magazine of Natural History' (vii. p. 468), and in his last catalogue (1872), unfortunately criticises these plates with some severity, but at the same time expresses his decided conviction of the identity of the Niaré of Du Chaillu with the Buffalo of Central Africa and Sierra Leone, upon specimens of which his *Bubalus brachyceros* was founded. In this opinion I fully concur with Dr. Gray, and consider that the fact of M. Du Chaillu's description and plates so accurately representing the specimen on the table (which on its part, in a mutual combination of characters, exhibits such decided specific identity both with Pel's specimens and with the original of the *Bos pumilus* of Turton)

presents further proof that the various specimens above referred to represent one and the same species.

I now proceed to consider the question of the identity of this small hairy-eared Buffalo of Equatorial, Western, and Central Africa (which should be called *Bubalus pumilus*) with the smaller species of Buffalo observed by Rüppell, Heuglin, and others in Eastern Africa.

In the Zoological Gardens at Berlin I observed with very great interest two Buffaloes, male and female, which, although labelled *Bubalus caffer*, appeared to me to differ materially from that species. My friend Professor Peters (whom I must here take opportunity to thank for the indefatigable kindness and hospitality I experienced from him during my stay at Berlin) upon my request ascertained from Dr. Bodinus that these animals had been sent home by the well-known collector Casanova from Upper Nubia. A careful drawing (which I now exhibit) taken for me by Herr Metzel conveys a faithful idea of the appearance of these Buffaloes as seen by me nearly a year ago. But as the animals were then immature and growing fast, I feared that possibly, in the time which had intervened since I last saw them, characters might have appeared which I had not anticipated, and which would modify the opinion I had at that time formed. In order to guard against this, I wrote to Professor

Fig. 4.

$\frac{1}{10}$

Head of *Bubalus caffer* ♂.

Peters since the commencement of this paper, and requested him to procure for me a drawing of the head of the male Buffalo as he now appears. The result was the beautiful etchings (Plate XLII. figs. 1 & 2) which I have the pleasure of laying before you. It may be seen by a comparison of this drawing with that of a very fine specimen of the horns of *Bubalus caffer* (fig. 4, p. 480) that, in their *flattened* compressed character, and in their general position on the head, the horns of the Buffaloes living at Berlin differ essentially from that species, and that in these particulars they resemble precisely a specimen in the British Museum (fig. 5), brought by

Fig. 5.

Head of *Bubalus pumilus*, ♂ (race *b*); specimen brought by Baker from Abyssinia.

Sir Samuel Baker from North-eastern Africa. There can therefore, I think, be no doubt of the propriety of referring the animals living at Berlin, along with Sir Samuel's specimen, to the *Bubalus caffer*, var. *æquinoctialis* of Blyth (P. Z. S. 1866, p. 371), especially as that gentleman in his paper alludes to Sir Samuel's specimen under that name. But further, when we compare the great shaggy ears of the East-African specimens (depicted in Herr Metzel's drawings) with these characters as exhibited in the Central-African specimens figured by Blyth (P. Z. S. 1863, p. 158) and observe in the coloured drawing of the female *Bos pumilus* from Sierra Leone (which is still preserved in the Society's collection), in addition to the large hairy ears, the same tawny tint which is shown, though more feebly, in the East-African male, a strong suspicion arises that we have here to deal with one widely distributed species.

The identity of the animal procured by Captain Clapperton in Central Africa with the smaller species of Buffalo met with by Rüppell during the early part of this century, and more recently by Heuglin in Eastern Africa, has, however, long been suspected. A female at present existing in the Senckenbergian Museum at Frankfort stands labelled, and has, I believe, been always considered by Dr. Rüppell a specimen of *Bubalus brachyceros*. Heuglin also, in his 'Antilopen und Büffel' (1863, p. 25), enters with some care into a comparison of the two species of Buffalo met with by him in North-east Africa, the smaller of which he refers to the *Bubalus brachyceros* of Gray.

In conclusion, I would say that although, in my opinion, the matter is far from being satisfactorily settled, yet I consider that the fact of the smaller species of Buffalo of Eastern Africa possessing the remarkably shaggy ears hitherto supposed to be characteristic of the Buffalo of Central and Equatorial Africa, taken in connexion with the significant fact that, as regards the character and inclination of the horns, intermediate examples completely bridge over the wide difference of characters exhibited by such specimens as the animals now alive at Berlin and the skull and horns we have this evening considered, goes far to strengthen the probability that the various specimens mentioned in this paper represent but one species—a species that in the course of its distribution over an area so extensive and diversified varies considerably, becoming more sharply definite in distinctive characters as it reaches the western limits of its range.

Should this view be correct, it is remarkable that *Bubalus caffer*, possessing an equally wide geographical range, exhibits no analogous variations, specimens from Abyssinia being, so far as I am aware, indistinguishable from those from the Cape.

Although the correctness of this conclusion appears to me in a high degree probable, I have considered it advisable, in the subjoined arrangement of the synonymy of *Bubalus pumilus*, to keep the references connected with the eastern and western races distinct. It will be easy to unite them should future research establish the specific unity of the two forms.

It will be seen also that I have included *Bubalus planiceros* (Blyth, P. Z. S. 1863, p. 157, figs. 4 & 4*a*) amongst the synonyms of the western race, as, although the horns in the College of Surgeons and in the King's-College Museum (upon which Mr. Blyth established the species) exhibit some peculiarities in common, I have been unable to perceive their specific value. At the same time it is with much diffidence that I venture to dissent from so high an authority in the Bovidæ as Mr. Blyth.

BUBALUS PUMILUS.

Horns short, compressed from before backwards, separate at their roots, and spreading almost horizontally outwards until they become suddenly attenuated and rounded, their tips turning upwards and in some specimens backwards. Their anterior basal surfaces much flattened, and traversed by numerous transverse corrugations.

Ear-conches large and bordered with a dense pendent fringe of hair. Stature smaller than that of *Bubalus caffer*. Colour ruddy brown, inclining to rufous in females of the western race (*a*).

a. *Stirps occidentalis*, ♂ :—

1555. *Petit Bœuf d'Afrique*, Belon, Observ. plus. Sing. Grèce, As. &c. pp. 120, 119 and figure.
1686. *Wild Bull*, Grew, Rar. Roy. Soc. p. 26.
1771. *Petit Bœuf d'Afrique*, Penn. Syn. p. 8, fig. 9, no. 7.
1781. *The Dwarf*, Penn. Quad. p. 30. no. 10, pl. 27. fig. 3.
1806. *Bos pumilus*, Turt. Trans. Syst. Nat. p. 121.

♀ :—

1837. *Bubalus brachyceros*, Gray, Mag. Nat. Hist. vol. i. (n. ser.) p. 587.
1839. —— ——, Gray, Ann. & Mag. Nat. Hist. (1st ser.) p. 284 t. 13.
1843. —— ——, Gray, Spec. Mamm. Brit. Mus. p. 153.
1852. —— ——, Gray, Cat. Mamm. Brit. Mus. p. 24.

♂ :—

1852. *Bubalus caffer*, juv., Gray, Cat. Mamm. Brit. Mus. p. 28, tab. 2. fig. 3.
1854. *Bos brachyceros*, Pel, Bijdr. tot d. Dierk. p. 33, plates.
1861. —— ——, Du Chaill. Expl. Eq. Afr. pp. 125, 175, 204, plates.
1863. *Bubalus reclinis* and *B. planiceros*, Blyth, P. Z. S. pp. 157, 158. figs. 3 & 4.

♀ :—

1863. *Bubalus brachyceros*, Blyth, P. Z. S. p. 157, figs. 1 & 2.
1872. —— ——, Gray. Cat. Rum. Brit. Mus. p. 10.

♂ :—

1872. *Bubalus reclinis*, Gray, Cat. Rum. Brit. Mus. p. 12.
Hab. Central Africa, Sierra Leone, Gaboon.

b. *Stirps orientalis* :—

1863. *Bos brachyceros*, Heugl. Antilop. u. Büff. p. 25, pl. 3. fig. 12.
1866. *Bubalus caffer*, var. *æquinoctialis*, Blyth, P. Z. S. p. 371, fig. 1 & 1*a*.
1872. *Bubalus centralis*, Gray. Cat. Rum. Brit. Mus. p. 11.
Hab. Abyssinia and Upper Nubia.

The following is the list of male specimens examined, placed in the order in which their respective characters appear to me to glide into each other :—

a. Type of *Bubalus pumilus*. Mus. Brit.
b. Specimen in my own collection (figs. 1 & 2, p. 475).
c. Specimen represented by Pel on his first plate (*l. s. c.*). Mus. Lugd.
d. That represented on Pel's second plate (*l. s. c.*). Mus. Lugd.
e. Skull and horns purchased by Mr. Blyth from Mr. Jamrach. Mus. Brit.

f. Skull and horns (♂) brought by Baikie from Niger. Mus. Brit.
g. Skull and horns brought by Baker from East Africa (fig. 5, p. 481). Mus. Brit.
h. Living animal in the Berlin Zoological Gardens.

The following are specimens representing females:—

i. Skull and horns brought by Baikie from the Niger. Mus. Brit.
j. Younger specimen from the same locality.
k, *l*. Captain Clapperton's two specimens (fig. 3, p. 478). Mus. Brit.
m. Living animal at Berlin.

2. On *Lepilemur* and *Cheirogaleus*, and on the Zoological Rank of the *Lemuroidea*. By St. George Mivart, V.P.Z.S.

[Received April 15, 1873.]

(Plate XLIII.)

The increase which has taken place in the zoological treasures of our National Collection enables me to offer to the Zoological Society of London, some notes on the *Lemuroidea*, to supplement the two papers which I have had the honour to communicate to this Society on previous occasions*.

There are now in the British Museum complete skeletons of *Indris diadema*, *I. laniger*, and *Lepilemur mustelinus*, as well as no less than three detached skulls of the last-named genus. I find that the new skull and skeleton of *I. laniger*† serve to confirm all the characters before attributed by me‡ to that species, except that the suprazygomatic backwardly projecting process of the malar is rudimentary, that the nasal bones become gradually narrower transversely from before backwards, and that the fourth metacarpal is the longest. I find also that it agrees with *Indris brevicaudatus* and differs from the genus *Lemur* in the following points:—

1. The spine of the axis is produced forwards, but not backwards.
2. The spine of the sixth cervical vertebra is largely developed and the most elongated, not counting the axis.
3. The cervical neural laminæ are medianly notched posteriorly.
4. The neural lamina of the seventh cervical vertebra is the shortest antero-posteriorly after that of the atlas.
5. There is a marked, antero-posteriorly directed hypapophysial ridge running medianly beneath the centrum of the 2nd, 3rd, 4th, and 5th cervical vertebræ, each such ridge ending in a posteriorly and downwardly directed hypapophysial process.
6. There are eight lumbar vetebræ.
7. The spinous processes of the lumbar vertebræ are subquadrate and nearly vertical.

* P. Z. S. 1864, p. 611. and 1867, p. 960.
† No. 1512*b*.
‡ P. Z. S. 1866, p. 151.

W.H Wesley. lith

LEPILEMUR MUSTELINUS.

M & N Hanhart imp

8. The transverse diameter of the thorax exceeds its depth.

9. The dorsal region of the spinal column is relatively very short.

10. The cartilages of the ribs slightly expand before joining the sternum.

11. There are no hyperapophyses.

12. There is no intermedium in the carpus.

I find, on the contrary, that it differs from *I. brevicaudatus* in that the groove which extends along the axillary margin of the scapula is not visible on the dorsum of that bone, as also that the anterior inferior spinous process of the ilium is relatively smaller and less prominent.

There are, moreover, one or two caudal chevron bones ; but these are minute.

The absolute and relative dimensions of the bones are given in the Table annexed to this paper.

The skull and skeleton of *I. diadema** are those of a specimen which, from the condition of the teeth, is evidently even more than adult. Comparing it with the description and figure of the immature specimen from Berlin before described by me†, I find that, with slight differences as to proportion and development of ridges, due to age, it agrees completely, except that there is a minute malar foramen, that the posterior palatine foramen situated behind the last molar cannot be called small, and that the canines are long and pointed and destitute of that production of the anterior margin which exists slightly in *Indris brevicaudatus* and so largely in *I. laniger*.

The size and proportions of the skull are extremely like those of *I. brevicaudatus* ; but in the adult, as in the young, the muzzle is slightly shorter relatively.

The axial and appendicular skeletons show also a great resemblance to the same parts in *I. brevicaudatus*, except that the humerus is relatively longer, and the femur shorter, while the ulna is stouter and diverges further from the radius.

The scapula and ilium agree with those of *I. brevicaudatus* in that the former has the axillary groove visible on the dorsum of the bone, and the latter has an anterior inferior spinous process greatly developed ; it is even more developed than in *I. brevicaudatus*.

As regards the twelve points above enumerated (as those in which *I. laniger* agrees with *I. brevicaudatus* and differs from the genus *Lemur*), I find that *I. diadema* agrees with the other *Indrisinæ* examined by me, except that the spine of the axis extends somewhat backwards over the third cervical vertebra. I find no chevron bones attached to the caudal vertebræ ; but they may have been accidentally lost, as has no doubt been the case with the intermedium of the carpus, since Professor Alphonse Milne-Edwards has been so kind as to inform me that this bone exists in all the individuals (about

* No. 1533*b* ; 70. 5. 5. 2 in the British-Museum collection.

† P. Z. S. 1867, p. 247, pl. xviii.

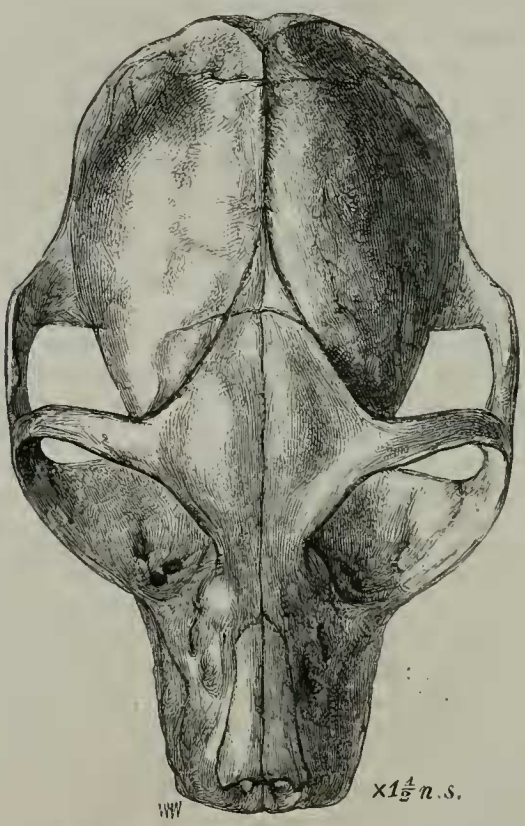
twelve) examined by him. He also tells me that the so-called lower canine is really an incisor, and that canines below are wanting in the adult.

"Chez les jeunes Indrisines la canine inférieure existe, mais elle tombe et n'est jamais remplacée. Il y a aussi 3 prémolaires inférieures dont 2 seulement sont remplacées, de façon que, pour la mâchoire inférieure la dentition de lait ressemble tout-à-fait à celle des Lémures, I. 2, C. 1, Prém. 3, M. 3."

The *Indrisinæ* form an exceedingly natural group; and it is satisfactory to note that Dr. Gray (in his 'Catalogue of Monkeys and Lemurs,' 1870, p. 89) has removed *I. laniger* from the vicinity of *Galago* and placed it next to the other species, though he still retains it in a tribe distinct from them, termed *Microrhynchina*.

Turning now to the next notable addition to the national collection, the skeleton of *Lepilemur*, I find that the skull agrees as to its characters with the specimen in the Jardin des Plantes, before described by me*.

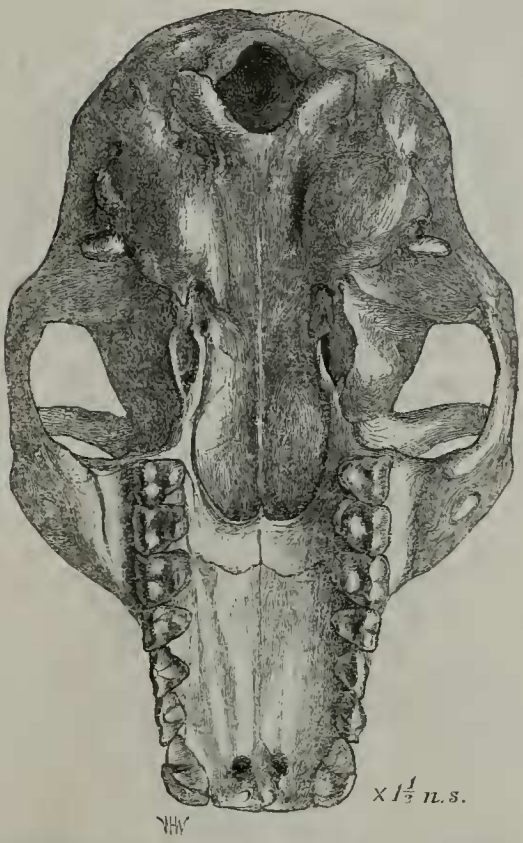
Fig. 1.



Dorsal aspect of skull of *Lepilemur mustelinus*.

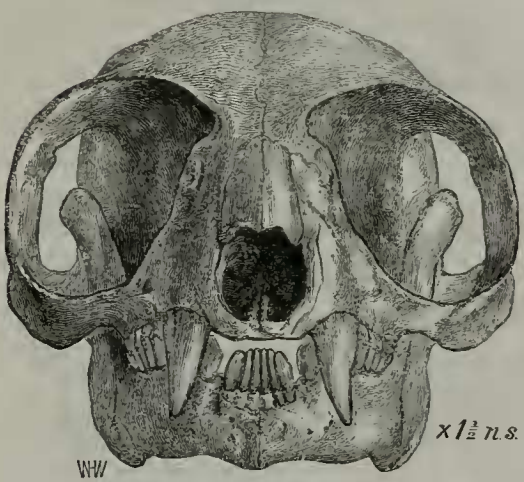
* P. Z. S. 1867, p. 968.

Fig. 2.



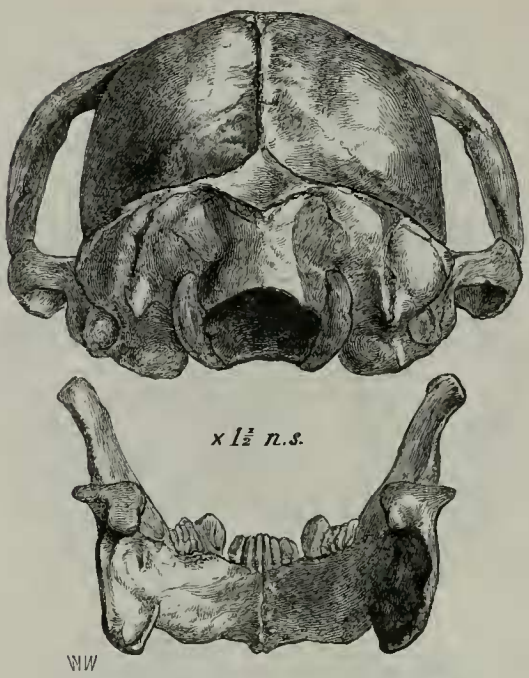
Ventral aspect of skull of *Lepilemur mustelinus*.

Fig. 3.



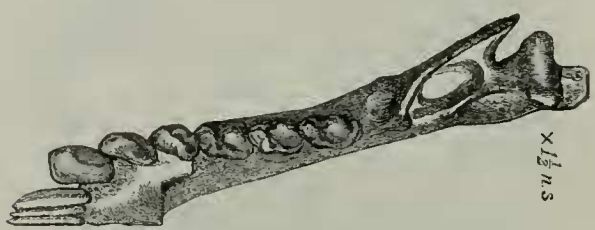
Front view of skull of *Lepilemur mustelinus*.

Fig. 4.



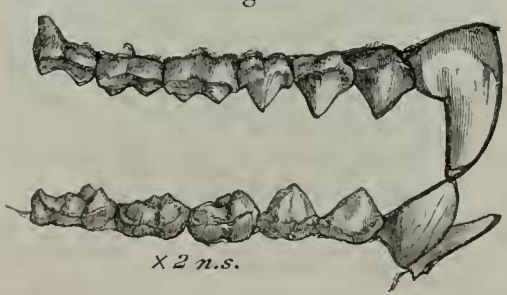
Hinder view of skull and mandible of *Lepilemur mustelinus*, showing the broad prolongation downwards of the articular surface of the mandibular condyle.

Fig. 5.



Dorsal aspect of right half of mandible of *Lepilemur mustelinus*.

Fig. 6.



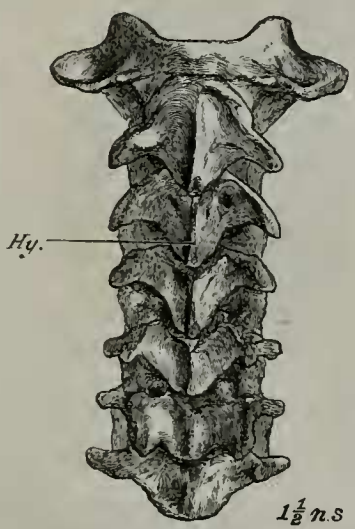
Side view (right) of dentition of *Lepilemur mustelinus*.

As to the rest of the skeleton (which is figured entire in Plate XLIII.), the dimensions and proportions are given in the Table annexed to this paper; but it is worthy of remark that in several important points it shows a marked approximation to *Indris*.

1. Thus the cervical neural laminæ show a tendency to be medianly notched posteriorly.

2. There are a median hypapophysial ridge and process beneath the second, third, and fourth cervical vertebræ, which ridges are even more developed relatively than in any of the *Indrisinæ* (fig. 7, *Hy*).

Fig. 7.



Ventral aspect of cervical vertebræ of *Lepilemur mustelinus*.
Hy, hypapophysial ridge.

3. There are nine lumbar vertebræ.

4. The transverse diameter of the thorax exceeds its depth.

5. The dorsal region of the spinal column is relatively very short.

6. There are no hyperapophyses.

7. I find existing that very remarkable character hitherto only known amongst Primates, in *Homo*, *Troglodytes*, and *Indris*—the absence of an *os intermedium* in the carpus.

On the other hand—

1. The sixth cervical spinous process is rudimentary.

2. The spinous processes of the lumbar vertebræ terminate acutely and are much inclined.

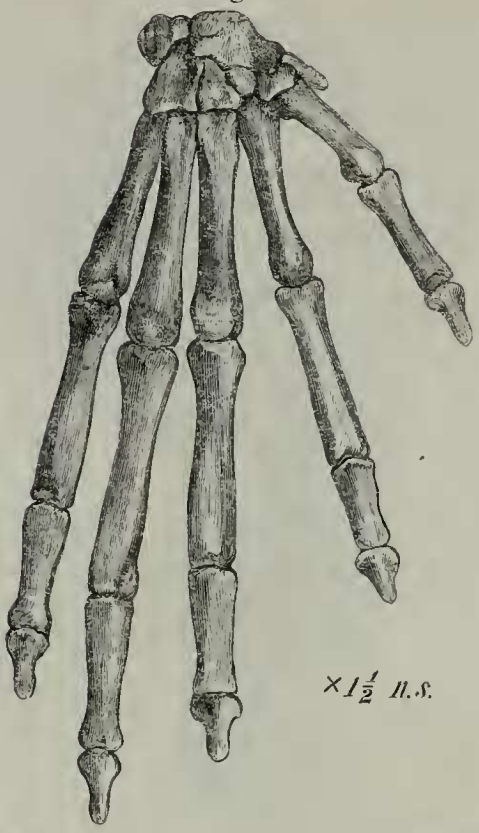
3. The cartilages of the ribs do not expand before joining the sternum.

4. The tail, though short, is furnished with four small chevron bones.

5. The naviculare is rather elongated.

The skull differs from that of the *Indrisinæ* and agrees with that

Fig. 8.



Dorsal aspect of right manus of *Lepilemur mustelinus*.

of the *Lemurinæ* in developing a sagittal ridge, and in not having the glenoid surface concave transversely and protected externally by a depending zygomatic process.

On the other hand the condyle of the mandible has its articular surface quite remarkably prolonged downwards behiud the ascending ramus, though the prolongation is much broader relatively (fig. 4, p. 488) than in the *Indrisinæ*, and is an exaggeration of what is to be seen in *Hapalemur*. The internal condyle of the humerus is perforated; and the fourth digit is the longest, both in the manus and in the pes.

Thus *Lepilemur* seems to be that genus of the *Lemurinæ* which most approximates to the *Indrisinæ*.

It shows some affinities to the *Cheirogalei*, notably in its elongated naviculare; but it is also somewhat closely related to *Hapalemur*.

The last-named genus is now represented in the British Museum by a skeleton of *Hapalemur simus*.

I find that this skeleton quite agrees with that in the Paris collection, before noticed by me*, except that the spine of the axis is backwardly produced.

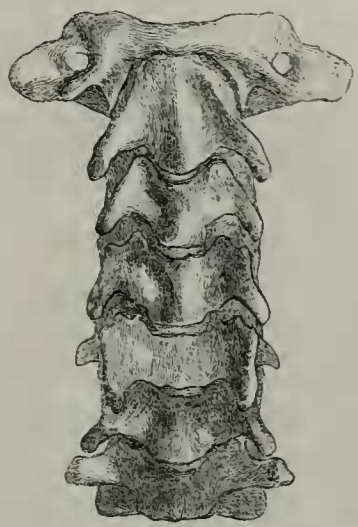
* P. Z. S. 1867, p. 960.

It may be well to add here that :—

1. The sixth cervical spine is moderately developed.

2. There is no hypapophysial ridge beneath the cervical vertebræ (fig. 9).

Fig. 9.



Ventral aspect of cervical vertebræ of *Hapalemur simus*.

3. The spinous processes of the lumbar vertebræ are elongated, pointed, and very much inclined forwards.

4. The transverse diameter of the thorax is rather less than its depth.

5. The dorsal region of the spinal column is of moderate extent.

6. The cartilages of the ribs are not expanded before joining the sternum.

7. There are no hyperapophyses.

8. The naviculare is relatively short (fig. 14, *n*, p. 501).

The dimensions and proportions are given in the Table annexed to this paper.

The last genus to be noticed in this paper is *Cheirogaleus*.

I have more than once expressed a doubt as to the validity of the distinctions between *Cheirogaleus* and *Microcebus*, which I reduced in 1867* to "a few cranial and dental characters."

I am now fully convinced that the so-called *Microcebi* and *Cheirogalei* constitute but a single natural genus, which must of course bear the older designation, namely *Cheirogaleus*.

Since my last paper on the *Lemuridæ* was published, various skins and osteological specimens have been added to the national collection; and I had contemplated revising the species as far as the materials at hand would permit.

Professor Milne-Edwards, however, has very kindly informed me that he is occupied with M. Alfred Grandidier in preparing for pub-

* P. Z. S. 1867, pp. 966 & 972.

lication a magnificent work on the Fauna of Madagascar, in which no less than 300 plates are to be devoted to Mammalia. He also tells me that he has now specimens of almost all the species in spirit, as well as skeletons, and even fœtuses.

These treasures are due to the noble devotion to science of M. Grandidier, who has spent so long a period in persevering and arduous explorations in Madagascar, and who now places the scientific world under yet further obligations to him by causing the copious illustrations just referred to to be executed at his own cost.

It would thus be labour lost, and useless occupation of space in the Society's 'Proceedings,' to attempt here in London a revision of the species of *Cheirogalei*. I will therefore merely make a few passing observations.

In the first place it may be useful to record where the types of various species are deposited.

The typical specimens of the so-called species (1. *typicus*, 2. *minor*, and 3. *smithii*) are preserved in the British Museum.

Those of 4. *milii*, 5. *furcifer*, and 6. *pusillus* are in Paris; and 7. *myoxinus* is in Berlin.

Professor Milne-Edwards informs me that the species which have been termed *smithii*, *minor*, *myoxinus*, *gliroides*, *rufus*, and *pusillus* are all one—also that, as I had suspected*, *Ch. milii* and *typicus* are of the same species, and that the *major* of Geoffroy St.-Hilaire and the *adipicaudatus* of M. Grandidier are also the same species as *milii*—likewise that M. Grandidier's *C. samati* is the *medius* of Geoffroy, but that *coquereli* (which M. Grandidier was the first to describe under that name) is a good species.

The specimens added to the national collection are, amongst others:—

Four specimens attributed by Dr. Gray to his species *C. typicus* and four specimens attributed by him to his species *C. smithii* (since called, in his Appendix to Catalogue†, *Azema smithii*), also two specimens called by him in the British Museum Catalogue‡ *Cheirogaleus milii*, but since erected by him into the type of his new genus§ *Opolemur*.

The three other new genera also instituted by Dr. Gray (namely *Murilemur*‖ for *Cheirogaleus minor*, and *Phaner*¶ for *Cheirogaleus furcifer*, and *Mirza*** for *C. coquereli*) I cannot regard as having any real claim whatever to distinctness, any more than the genus *Prolemur* instituted by him for *Hapalemur simus*††.

All these matters, however, will soon probably be set at rest by the publication of the Fauna of Madagascar.

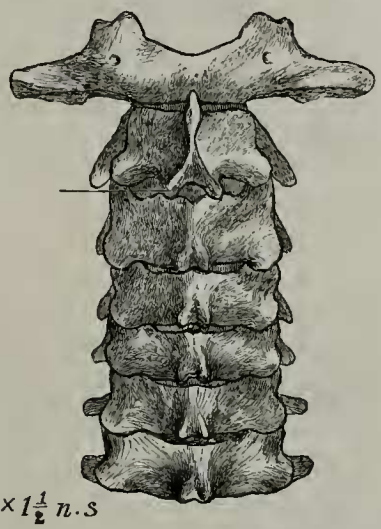
As to the position of the genus *Cheirogaleus*, it must, I think, be removed from that proximity to *Lemur* which I assigned to it in 1864, and be relegated to the vicinity of *Galago*, as has been done‡‡ by Professor Alphonse Milne-Edwards, in accordance with the clon-

* P. Z. S. 1867, p. 967.
† p. 134.
‡ p. 77.
§ P. Z. S. 1872, p. 854.
‖ *Loc. cit.* p. 857.
¶ *Loc. cit.* p. 855.
** *Loc. cit.* p. 857.
†† P. Z. S. 1870, p. 828, and 1872, p. 851.
‡‡ Revue Scientifique, 2nd Sept. 1871, p. 223.

gation of its tarsus, which, though varying in different species of *Cheirogaleus*, varies also in different species of *Galago*.

Of the characters in which my *Lemurinæ* were believed to differ from my *Galagininæ*, many must now, therefore, be eliminated, as will appear by the characters given below.

Fig. 10.



Dorsal view of cervical vertebræ of *Galago crassicaudatus*.

A skeleton of *Galago crassicaudatus* now in the Museum of the Royal College of Surgeons presents a character which I have never before remarked in any Primate. The neural spines of the cervical vertebræ, from the second to the seventh inclusive, bifurcate laterally. This, therefore, necessitates a correction, as to the cervical neural spines, in my paper* "On the Axial Skeleton of the Primates."

As to the *Cheirogalei*, M. A. Grandidier gives us† the following curious piece of information:—"Tous ces *Chirogalei* ont la curieuse faculté d'emmagasiner autour de leur queue et dans diverses parties de leur corps une provision de graisse qui sert à leur nutrition pendant les six mois de la saison sêche qu'ils passent en léthargie."

The specimens in the British Museum which have been named by Dr. Gray *Opolemur milii* exhibit an enlarged condition of the tail.

* P. Z. S. 1865, pp. 550-552 & 590.
† Revue Scientifique, 11th May, 1872, p. 1083.

	Length from atlas to caudal end of sacrum.	Length of entire pectoral limb.	Pectoral limb — manus.	Spine : 100 :: entire pectoral limb :	Spine : 100 :: entire pectoral limb — manus :	Scapula from glenoid to posterior vertebral angle.	Axillary margin of scapula.	Scapula, glenoid to vertebral end of spine.
	in.	in.	in.			in.	in.	in.
Indris brevicaudatus	18·0	16·55	11·25	91·9	62·5	3·1	2·8	2·2
I. diadema	15·60	14·98	10·10	96·66	64·7	...	2·80	2·25
I. laniger	9·10	8·67	5·65	95·2	62·0	...	1·64	1·32
Hapalemur	11·50	9·47	6·60	82·3	57·3	2·15	1·85	1·60
Lepilemur	8·30	7·39	5·00	89·0	60·2	1·70	1·43	1·20
Lemur	14·8	11·30	8·10	76·3	54·7	2·5	2·3	2·1
Galago	5·1	4·40	2·89	86·2	56·6	1·1	1·0	0·9
Loris	5·7	5·85	4·65	102·6	81·5	1·0	0·9	0·8

	Breadth of shaft at middle.	Breadth of humerus at tuberosities.	Breadth of humerus at condyles.	Spine : 100 :: length of humerus :	Length of radius.	Length of ulna.	Spine : 100 :: length of radius :	Length of humerus : 100 :: that of radius :
	in.	in.	in.		in.	in.		
Indris brevicaudatus	0·32	0·70	1·14	28·6	6·00	6·80	33·3	116·5
I. diadema	...	...	...	26·2	6·00	6·50	38·4	146·3
I. laniger	...	...	...	29·0	3·01	3·35	33·0	114·4
Hapalemur	0·27	0·53	0·80	27·1	3·60	4·12	31·3	115·3
Lepilemur	0·18	0·40	0·58	28·1	2·67	3·10	32·1	114·1
Lemur	0·30	0·62	0·93	27·3	3·71	4·60	25·0	91·6
Galago	0·11	0·25	0·40	31·7	1·67	1·90	32·7	103·0
Loris	0·12	0·28	0·31	39·4	2·48	2·64	43·5	110·2

	2nd phalanx of pollex.	Length of carpus.	1st phalanx of 3rd digit.	2nd phalanx of 3rd digit.	3rd phalanx of 3rd digit.	Index with metacarpal.	Longest digit with metacarpal.	Spine : 100 :: pollex with metacarpal :
	in.	in.	in.	in.	in.	in.	in.	
Indris brevicaudatus	0·42	0·58	1·60	0·91	0·40	3·80	4·82(4th)	13·8
I. diadema	0·49	0·57	1·40	0·98	0·45	...	4·45(4th)	15·3
I. laniger	0·24	0·26	0·81	0·55	0·23	...	2·80	13·1
Hapalemur	0·30	0·37	0·86	0·68	0·24	2·06	2·58(3rd)	11·3
Lepilemur	0·19	0·28	0·65	0·37	0·19	1·50	2·10(4th)	11·0
Lemur	0·24	0·57	0·96	0·61	0·23	2·58	2·80(4th)	10·0
Galago	0·11	0·17	0·45	0·39	...	0·89	.....	12·9
Loris	0·11	0·18	0·34	0·21	0·10	0·72	1·00(4th)	10·7

Anterior margin of scapula (straight).	Posterior vertebral angle.	Angle of glenoid with spine of scapula.	Angle of glenoid with axillary margin.	Angle of spine of scapula with vertebral margin.	Angle of spine of scapula with axillary margin.	Spine : 100 :: length of scapula :	Clavicle following curves.	Spine : 100 :: clavicle :	Length of humerus.
in.	°	°	°	°	°		in.		in.
1·8	45	110	130	115	28	17·2	2·25	11·6	5·15
...	45	...	...	...	36	...	2·25	14·4	4·10
...	43	...	...	...	20	...	1·24	13·6	2·64
1·35	50	75	130	105	25	18·6	1·47	12·7	3·12
1·00	39	85	125	115	17	20·4	1·00	12·0	2·34
1·9	48	110	126	120	20	16·9	1·5	9·7	4·05
0·8	50	105	128	120	17	21·5	0·83	14·2	1·62
0·7	49	92	130	112	37	17·5	1·0	14·0	2·25

Length of manus.	Spine : 100 :: manus :	Rest of pectoral limb : 100 :: manus :	Radius : 100 :: manus :	1st metacarpal.	2nd metacarpal.	3rd metacarpal.	4th metacarpal.	5th metacarpal.	1st phalanx of pollex.
in.				in.	in.	in.	in.	in.	in.
5·30	29·4	47·1	88·3	1·10	1·67	1·87	1·85	1·84	0·98
4·88	31·2	48·3	81·3	1·00	1·36	1·58	1·62	1·59	0·90
3·02	33·1	53·4	100·3	0·50	0·80	0·95	1·00	0·90	0·46
2·87	24·9	43·4	79·7	0·52	0·76	0·80	0·81	0·75	0·48
2·39	28·8	47·8	85·7	0·38	0·56	0·68	0·69	0·58	0·35
3·20	21·6	39·5	86·2	0·63	0·97	0·98	0·91	0·88	0·61
1·51	29·6	46·6	90·4	0·29	0·34	0·42	0·39	0·34	0·26
1·20	21·0	25·8	48·3	0·27	0·23	0·31	0·30	0·25	0·23

Spine : 100 :: longest digit with metacarpal :	Spine : 100 :: index with metacarpal :	Spine : 100 :: metacarpal of pollex :	Metacarpal of pollex : 100 :: metacarpal of index :	Length of entire pelvic limb.	Pelvic limb — pes.	Spine : 100 :: entire pelvic limb :	Spine : 100 :: pelvic limb — pes :	Entire pectoral limb : 100 :: entire pelvic limb :	Pectoral limb — manus : 100 :: pelvic limb — pes :
				in.	in.				
27·6	21·1	6·1	151·8	23·93	17·40	132·9	96·6	144·5	154·6
28·5	...	6·4	136·0	23·20	16·75	148·7	107·7	154·8	165·8
30·7	...	5·4	160·0	13·61	10·30	149·5	113·1	156·9	182·3
22·4	17·8	4·5	146·1	14·25	10·50	123·9	91·3	150·4	159·0
22·6	18·0	4·5	147·3	11·00	7·75	132·5	93·3	148·8	155 0
18·9	17·4	4·2	153·9	14·32	10·88	96·7	73·5	126·7	134·3
...	17·4	5·6	117·2	7·38	5·05	144·7	99·0	167·7	174·7
17·5	12·6	4·7	85·1	6·63	5·03	116·3	88·2	113·3	108·1

	Summit of ilium to tuberosity of ischium.	Curved crest of ilium.	Conjugate diam. of pelvis.	Transverse diameter of pelvis.	Ilio-pubic angle.	Angle of ischium with ilio-pectoral line.	Angle of ischium with vertebral margin of ilium.	Spine : 100 :: length of os innominatum :
	in.	in.	in.	in.				
Indris brevicaudatus	4·52	2·00	1·88	1·57	135°	137°	165°	25·1
I. diadema	4·54	2·00	1·40	1·66	...	...	...	28·1
I. laniger	2·81	1·12	1·20	1·10	...	...	...	30·8
Hapalemur	3·20	1·00	1·03	1·20	114	177	170	27·8
Lepilemur	2·57	0·65	0·72	0·84	117	167	156	30·9
Lemur	3·70	0·80	1·50	1·45	120	165	165	25·0
Galago	1·52	0·38	0 90	0·50	115	166	162	29·8
Loris	1·46	0·31	0·74	0·33	88	170	180	25·6

	Length of pes.	Spine : 100 :: pes :	Rest of pelvic limb : 100 :: pes :	Tibia : 100 :: pes :	Manus : 100 :: pes :	Length of tarsus.	Spine : 100 :: tarsus :	Pes : 100 :: tarsus :
	in.					in.		
Indris brevicaudatus	7·05	39·1	40·5	88·1	133·0	1·92	10·6	27·2
I. diadema	6·85	43·9	40·8	88·3	140·3	1·75	11·2	25·5
I. laniger	4·07	44·8	39·5	84·7	134·7	1·18	12·9	28·9
Hapalemur	4·38	38·0	40·2	85·3	152·6	1·35	11·7	30·8
Lepilemur	3·50	42·1	43·4	90·6	146·4	1·20	14·4	34·2
Lemur	4·50	30·4	41·3	88·5	140·6	1·60	10·8	35·5
Galago	2·57	50·3	50·8	108·4	170·1	1·24	24·3	48·2
Loris	1·82	31·9	36·1	73·3	151·6	0·58	10·1	31·8

	Length of index with its meta-tarsal.	Length of longest digit with its meta-tarsal.	Length of os calcis.	Length of naviculare.	Length of cuboid.	Longest digit without meta-tarsal.	Spine : 100 :: hallux with meta-tarsal :	Spine : 100 :: longest digit with metatarsal:
	in.	in.	in.	in.	in.	in.		
Indris brevicaudatus	...	5·21	1·37	0·31	0·53	3·14	20·5	28·9
I. diadema	4·50	5·10	1·34	0·35	0·51	3·13	24·8	32·6
I. laniger	1·37	2·89	0·74	0·40	0·35	1·69	21·8	31·7
Hapalemur	2·70	3·02	0·98	0·40	0·40	1·80	18·2	26·2
Lepilemur	2·05	2·27	0·90	0·41	0·34	1·35	18·9	27·3
Lemur	2·81	2·92	1·00	0·24	0·46	1·78	13·4	19·7
Galago	1·13	1·35	0·97	0·69	0·26	0·95	18·0	26·4
Loris	1·11	1·42	0·36	0·12	0·17	0·99	16·1	24·9

Length of femur : 100 :: that of os innominatum :	Length of femur.	Width at condyles.	Spine : 100 :: length of femur :	Humerus : 100 :: length of femur :	Length of femur : 100 :: its breadth at condyles :	Length of tibia.	Spine : 100 :: length of tibia :	Femur : 100 :: length of tibia :	Radius : 100 :: length of tibia :
	in.	in.				in.			
48·0	9·40	1·00	52·2	182·5	10·6	8·00	44·4	85·1	133·3
50·4	9·00	0·98	57·6	219·5	10·8	7·75	49·6	85·0	129·1
51·0	5·50	0·55	60·4	208·3	10·0	4·80	52·7	87·2	159·4
58·1	5·50	0·71	47·8	176·2	12·4	5·13	44·6	93·2	142·5
61·1	4·20	0·53	50·6	179·9	12·6	3·86	46·5	91·9	140·8
63·7	5·80	0·79	39·1	143·2	13·6	5·08	34·0	87·5	136·9
56·7	2·68	0·30	52·5	165·4	11·1	2·37	46·4	88·3	141·9
57·2	2·55	0·33	44·7	113·3	12·9	2·48	43·5	97·2	100·0

Length of 1st metatarsal.	Length of 2nd metatarsal.	Length of 3rd metatarsal.	Length of 4th metatarsal.	Length of 5th metatarsal.	1st phalanx of hallux.	2nd phalanx of hallux.	1st phalanx of 3rd digit.	2nd phalanx of 3rd digit.	3rd phalanx of 3rd digit.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1·95	2·00	2·04	2·07	2·02	1·15	0·60	1·71	1·05	0·44
2·00	1·90	2·00	1·97	2·00	1·14	0·73	1·54	0·90	0·50
1·08	1·10	1·12	1·20	1·20	0·53	0·38	0·78	0·42	0·30
1·00	1·18	1·16	1·23	1·25	0·63	0·47	0·86	0·52	0·26
0·80	0·90	0·92	0·90	0·83	0·45	0·32	0 63	0·30	0·21
1·06	1·25	1·21	1·14	1·15	0 61	0·32	0 94	0·62	0·22
0·45	0·42	0·43	0·40	0·42	0·30	0·17	0·46	0·27	0·10
0·47	0·45	0·47	0·43	0·44	0·27	0·18	0·51	0·34	0·14

Spine : 100 :: index with metatarsal :	Spine : 100 :: metatarsal of hallux :	Pes : 100 :: 2nd metatarsal :	Longest digit of manus with metacarpal : 100 :: that of pes with metatarsal:	Pollex : 100 :: hallux with metacarpal and metatarsal:	Spine : 100 :: os calcis :	Os calcis : 100 :: cuboides :	Length of lumbar vertebræ.	Length of cervical vertebræ.	Spine : 100 :: lumbar vertebræ :	Spine : 100 100 :: cervical vertebræ :
							in.	in.		
...	10·8	28·3	108·0	148·0	7·6	38·2	...	...	...	...
28·8	12·8	27·7	112·3	161·9	8·5	38·0	5·47	3·25	35·0	20·8
15·0	11·8	27·0	103·2	165·8	8·1	47·3	3·44	1·76	37·8	19·3
23·4	8·6	26·9	117·4	161·5	8·5	40·3	4·00	1·78	34·7	15·4
24·6	9·6	25·7	108·0	142·3	10·8	37·7	3·44	1·38	41·4	16·6
18·9	7·1	27·7	104·2	134·4	6·7	46·0	...	...	...	...
22·1	8·8	16·3	.....	139·3	19·0	26·8	...	...	...	...
19·4	8·2	24·7	142·0	150·8	6·3	47·2	...	...	...	...

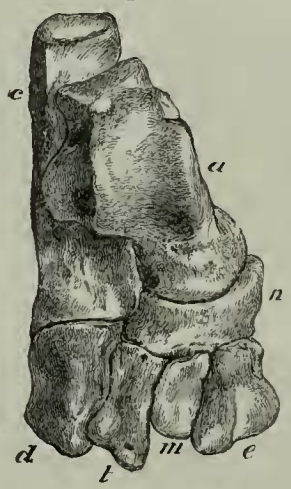
Indrisinæ.

Indris.

I. $\frac{2}{2}$, C. $\frac{1}{0}$, Pm. $\frac{2}{2}$, M. $\frac{3}{3}$, $=\frac{8}{7}=30$.

Characters.—Ears short; muzzle long, moderate, or rather or very short; hind limbs much longer than the fore limbs; index very short, much shorter than fifth digit; pollex short and placed far back; hallux very long and covered with hair; tail long, moderate, or very short; internal condyle of humerus perforated; carpus with or without an os intermedium; tarsus short; naviculare very short; sixth cervical spine long; cervical neural laminæ medianly notched posteriorly; neural lamina of seventh cervical vertebra shortest after that of the atlas; median hypapophysial ridges developed beneath the second to fifth cervical vertebræ; eight lumbar vertebræ; lumbar spinous processes subquadrate, and nearly or quite vertical; transverse diameter of thorax exceeding its depth; dorsal region of spine relatively short; cartilages of ribs slightly expanding before reaching the sternum; no hyperapophyses; first upper molar with four principal cusps, and from two to four supplementary cusps; last upper molar with only two well-developed cusps; the lower incisor with its outer surface longitudinally grooved; posterior lower premolar much antero-posteriorly extended; first

Fig. 11.



Dorsal aspect of left tarsus of *Indris diadema*.

a, astragalus; *c*, os calcis; *n*, naviculare; *e*, ento-cuneiforme; *m*, meso-cuneiforme; *l*, ecto-cuneiforme; *d*, cuboid.

lower molar with five more or less distinct cusps; last lower molar quinquecuspid; a paramastoid process; no interparietal; lachrymal foramen very near orbit; a process depending from zygoma in front of, and external to, the glenoid surface; a glenoid foramen; anterior palatine foramina very large; mandibular symphysis very long; condyle rounded, but very little transversely extended; articular

surface prolonged somewhat down the back of ascending ramus; digastric fossa more or less deep.

Hab. Madagascar exclusively.

Lemurinæ.

I. $\frac{1}{2}$ or $\frac{0}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3}$, $=\frac{7 \text{ or } 8}{9}=32$ or 34.

Carpus with or without an os intermedium; os calcis less than one fourth the length of tibia; naviculare from about half to nearly twice the length of the cuboid; cartilages of ribs not expanded before piercing the sternum; no hyperapophyses; spinous processes of lumbar vertebræ elongated, and much inclined forwards; caudal vertebræ with chevron bones.

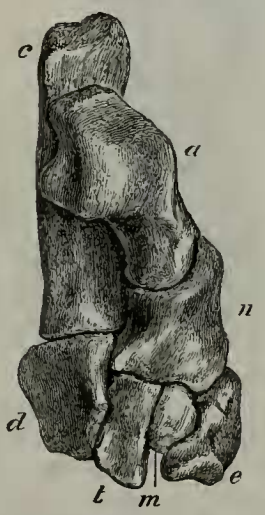
Hab. Madagascar exclusively.

Lepilemur.

I. $\frac{0}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3}$, $=\frac{7}{9}=32$.

Tail shorter than the body; muzzle longer than the orbit; first upper premolar more vertically extended than the others; premolars with only one external cusp; last lower molar with a large fifth cusp; præmaxillæ very small; an interparietal bone; palate very short; posterior palatine foramina small; a small molar foramen;

Fig. 12.



Dorsal aspect of left tarsus of *Lepilemur mustelinus*.
(Letters as before.)

sphenoidal fissure and foramen rotundum together represented by a single opening; angle of mandible produced downwards as well as backwards; mastoidal region of periotic inflated; articular surface of condyle remarkably prolonged downwards behind; cervical neural laminæ slightly notched posteriorly; a very conspicuous median hypapophysial ridge and process beneath the second, third, and

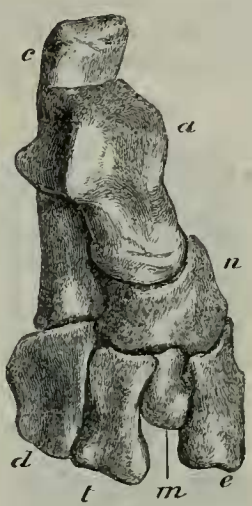
fourth cervical vertebræ, dorsal, and nine lumbar vertebræ; dorsal region of spine short; no intermedium to the carpus; length of os calcis less than one fourth that of tibia; naviculare not nearly twice the length of cuboid.

LEMUR.

I. $\frac{1}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3}$, $=\frac{8}{9}=34$.

Tail long; muzzle elongated; upper incisors subequal, both pairs anterior to the canines; first upper premolar shorter than the second; all upper premolars with only one large external cusp; first upper molar considerably exceeding the third premolar in size; upper canines very large; sphenoidal fissure and foramen rotundum normally distinct; angle of mandible not produced downwards; mastoidal region of periotic not inflated; dorsal and lumbar vertebræ together not more than twenty; tarsus short; os calcis less than one-fourth the length of tibia; naviculare little more than half the length of the cuboid.

Fig. 13.



Dorsal aspect of left tarsus of *Lemur*.

(Letters as before.)

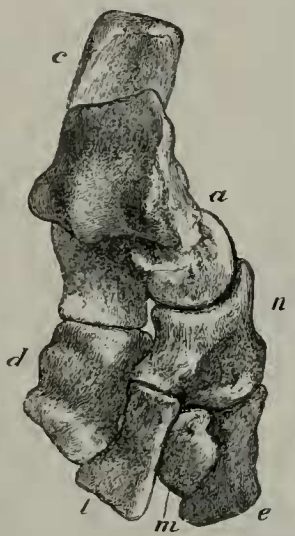
HAPALEMUR.

I. $\frac{1}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3}$, $=\frac{8}{9}=34$.

Tail long; muzzle short; upper incisors unequal, the posterior one on each side being quite internal to the canine, which is small. First premolar above longer than the second, but the dental series on each side very nearly equal; third premolar above shaped like the upper molars, which it exceeds in size; a paroccipital process; a large malar foramen; angle of mandible exceedingly large and

produced downwards and inwards as well as backwards; mastoidal region of periotic not inflated; dorsal and lumbar vertebræ together not more than twenty; tarsus short; os calcis less than one fifth the length of tibia; naviculare and cuboid subequal in length; no hypapophysial prominences beneath the cervical vertebræ.

Fig. 14.



Dorsal aspect of left tarsus of *Hapalemur simus*.
(Letters as before.)

Galagininæ.

I. $\frac{1}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3}$, $=\frac{8}{9}=34$.

Upper molars with an oblique ridge from the postero-external to the antero-internal cusp; tarsus elongated; os calcis more than one fourth the length of the tibia; mammæ two pectoral and two inguinal.

Hab. Africa and Madagascar.

Cheirogaleus.

Tail longer than body. Upper incisors unequal, the anterior pair the larger; third upper premolar very much smaller than the first molar, and with only one external cusp; first upper premolar as extended vertically as the second or more so; the postero-internal cusp of upper molars very small or absent; palate much prolonged beyond the last molars; præmaxillæ largely developed, joining the nasals for more than a quarter of their (the nasals') extent; an interparietal bone; mastoidal region of periotic not inflated; dorsal and seven lumbar vertebræ; an intermedium in carpus; length of os calcis more than one fourth that of tibia; naviculare not twice the length of the cuboid, sometimes but little exceeding it; gall-bladder with its base turned towards the back.

Hab. Madagascar exclusively.

Fig. 15.

Tarsus of *Microcebus*.

Fig. 16.

Tarsus of *Cheirogaleus furcifer*.

Galago.

Upper incisors subequal; first upper premolar longer than the second; third upper premolar with two large external cusps, and about equalling the first molar in size; postero-internal cusp of second and third molars well developed; tarsus very long; os calcis from a little less to more than one third the length of the tibia; naviculare much longer than the cuboid; ears very large; tail long; mastoidal region of periotic inflated; no interparietal; one opening, representing both the foramen rotundum and sphenoidal fissure; dorsal vertebræ thirteen, lumbar vertebræ six; gall-bladder with its base not turned towards the back.

Hab. Africa (not Madagascar).

Fig. 17.

Tarsus of *Galago*.

Fig. 18.

Tarsus of *Galago crassicaudatus*.

Zoological rank of the Lemuroidea.

I feel it incumbent on me not to pass over another question of higher and more general interest—namely, the zoological rank and position of the group of Lemuroids as a whole.

In 1864* I ventured to propose that the whole group of Lemuroids (or Half-Apes) should be raised to the rank of a suborder of the order *Primates*. For that suborder I proposed the term *Lemuroidea*, assigning the parallel designation *Anthropoidea* to the higher suborder—the suborder, that is, containing the Apes and Man.

This suggestion has been adopted by some naturalists; but a still further separation of the Half-Apes from the Apes has met with recognition and approval in France; and Professor Alphonse Milne-Edwards, M. Grandidier, and M. Paul Gervais agree with the late M. Gratiolet in considering that the Lemuroids should rank as a distinct order of Mammals.

The distinctions brought forward by these authors to justify this separation and already published are certainly numerous and very important; and Professor Alphonse Milne-Edwards has had the kindness to inform me of others yet more startling, which he has kindly given me permission to communicate.

M. Gratiolet, in speaking of the cerebral convolutions of the Lemuroids observes† that natural analogies compel him to place the Lemurs in a separate group from the Apes, and at the head of the Bats and Insectivora.

M. Paul Gervais‡, speaking of the affinities of the Lemurs, expresses himself as follows:—"Malgré l'habitude que l'on a jusqu'ici conservée, de parler de ces animaux dans les cours ou d'en écrire l'histoire dans les traités, à la suite des véritables Singes, on doit reconnaître que des caractères importants séparent l'une de l'autre ces deux catégories d'animaux, et si l'on partage les Mammifères en un plus grand nombre d'ordres que ne le voulaient Cuvier et De Blainville, plus particulièrement encore, si l'on admet qu'il doit y avoir parmi ces animaux autant d'ordres séparés qu'il y a de groupes réellement naturels et indépendants entre eux, il devient nécessaire de partager en deux ordres distincts les Singes et les Lémures."

Professor Alphonse Milne-Edwards has given§ the following characters as amongst those justifying the erection of the Lemuroids into a distinct order:—

1. The bell-shaped placenta‖.
2. The vast size of the allantois.
3. The much uncovered condition of the cerebellum.
4. The cranial structure.
5. The inferior incisors.

* P. Z. S. 1864, p. 635.

† Mém. sur les plis cérébraux, 1854, p. 22.

‡ "Encéphale des Lémures," Journal de Zoologie, tom. i. p. 7.

§ Revue Scientifique, 2nd Sept. 1871, p. 222.

‖ For details see Ann. des Sc. Nat. Oct. 1871, Art. No. 6, and Acad. des Sc. Aug. 14th, 1871.

6. The structure of the extremities—pollex largely developed, and fingers with discoidal terminations.

In a private communication the learned Professor has been so kind as to furnish me with further information, the importance of which is not to be contested.

He says that the Lemuroids have no *decidua*, and that the placenta is diffuse!

The characters above quoted certainly constitute important distinctions; nevertheless with respect to some of them a few remarks must be made.

First, as regards the brain, Professor Flower, in his paper on the brain of the Javan Loris*, remarks on the presence of the median lobe in *Lemur*, although it is lost in *Hapale*, and adds "it is perhaps the sulci of the inner part of the hemisphere that are most characteristic of the Primates, and offer the most striking differential features from the other Mammalia. Here, too, the Lemuridæ follow strictly the higher type. That essentially primatial sulcus, the calcarine, which persists deeply marked in the little *Hapale jacchus*, when every other trace of fissure, except the Sylvian, is gone, is equally well developed in both *Lemur* and *Stenops*."

M. Paul Gervais himself admits† that "les Lémures n'ont jamais que deux circonvolutions autour de la scissure, et, dans certains cas, ils en manquent, tandis que les Carnivores, même les plus petits, en ont toujours au moins trois."

With respect to cranial structure, the prolonged muzzle of Lemur is indeed markedly different from that of most Apes, but hardly, if at all, more so than is that of *Cynocephalus chacma* from that of *Chrysothrix sciurea*. The orbit opens more widely into the temporal fossa than in any Ape; but *Tarsius* differs in this from *Semnopithecus* not so very much more than *Semnopithecus* differs from *Mycetes*.

The development of the pollex is certainly excessive; but the difference in this between any Lemuroid and any Ape is nothing compared with the differences between different Apes.

As to that most striking placental character, for the knowledge of which we are indebted to M. Alphonse Milne-Edwards, it must be remembered that the Edentata form a very natural group; and yet the placenta differs strangely in different forms, apparently even to the extent of being non-deciduate, as well as deciduate. Again the *Proboscidea* have a deciduate placenta, as also has *Hyrax*, the affinities of which latter to the non-deciduate Ungulata, palæontology seems more and more to render unquestionable.

In spite, however, of all that may be advanced, it cannot be denied that the differences between the Lemuroids and Apes are very important as well as numerous; and great deference is due to the opinion of a naturalist so eminent as Professor Alphonse Milne-Edwards.

But to decide the question whether the Primates are still to continue to rank as one ordinal group, or whether the Lemuroids are to be separated as a distinct order, it will be necessary to consider the

* Trans. Zool. Soc. vol. v. p. 108. † *Loc. cit.* p. 27.

principles upon which zoological classification should repose, and the value to be assigned to the various kinds of anatomical resemblance.

Until a recent date, zoological classifications reposed on similarities of form and structure accepted simply and without reference to genealogical considerations.

Of late years, however, the theory of evolution (and especially the Darwinian form of it) has complicated the inquiry by introducing the distinction between characters which may be reasonably considered to be due to inheritance and others, called *adaptive*, which may be supposed to have originated in necessary conformity to the conditions of life.

The doctrine has now been widely received that zoological classification should represent (as far as possible) the genealogical tree of animal life, and therefore that it should repose, by preference, on characters having a genetic significance, while adaptive characters should be, as much as possible, eliminated.

Four questions then naturally suggest themselves :—

1. Is it possible always, generally, or ever, to decide with certainty, of any given set of characters, that some such characters are genetic and certain others adaptive?

2. Is it possible now to class animals by genetic characters only? and is no zoological classification to be considered satisfactory until based upon such characters?

3. Is it desirable that animals should not be grouped together into an order unless it can be supposed that they have all sprung from a common ancestor, which was not also the ancestor of any other group (of more or less similar size) belonging to the same class?

4. Is it desirable that no group of animals which can be reasonably supposed so to have sprung, should be divided into two or more orders?

As to the first question there seems to be great difficulty in arriving at a satisfactory decision.

It is true that the coexistence of a great many common characters, such as, *e.g.*, the course of the carotid arteries in all Marsupials and the more or less aborted condition of certain of the digits of the *pes* in many Marsupials, seem plainly to be due to community of descent; but many other structures *cannot* be due to such a cause, and yet seem to be equally uncaused by the exigencies of life-preservation or reproduction. As examples of these latter I may refer to the osseous investment of the temporal fossa in *Chelonia*, *Pelobates*, and *Lophiomys*, the compound tooth-structure of *Orycteropus* and *Myliobatis*, the coexistence of a certain form of dentition with a saltatory habit in *Macropus* and *Macroscelides*, the presence of but eight carpal bones in *Troglodytes*, *Indris*, and *Lepilemur*, and the course of the vertebral artery in *Auchenia* and *Myrmecophaga*. Thus characters may be due to no visible life-exigency, and yet not genetic, while, on the other hand, characters may be thoroughly genetic, and yet of great utility.

Manifestly, then, very great caution is necessary in discriminating between genetic characters and characters purely or mainly adaptive.

Experience has more and more persuaded me that the number of similar structures which have arisen independently is prodigious.

The elaborate investigations of my friend Mr. Parker constantly bring before us an increasing number of complex cross relations and more and more entangled interdependencies; and I am convinced that by means of such careful and minute researches many of the genealogical trees which have been developed with the rapidity of the fabled "bean-stalk" are destined to enjoy an existence little less ephemeral.

The notion that "similarity of structure" necessarily implies "genetic affinity" can no longer be ranked as a biological axiom.

If, then, it is so difficult to decide as to which characters are genetic and which adaptive, the second question can be answered at once. Evidently anatomical science does not *now* enable us to group even the Mammalia by genetic characters; yet surely the main features of Mammalian classification may be considered to be satisfactorily established.

The third question concerns the exclusion from any order of all species which cannot be supposed to have sprung from an ancestor common to them and to all the other species.

To confine our attention to the Mammalia, can it be considered certain that the *Balænoidea* and the *Delphinoidea* sprang from an ancestor which at the same time was the ancestor of no species belonging to any other special order of existing Mammals? And if we could demonstrate that such had not been the case, would that be a reason for breaking up the very natural and, on the whole, homogeneous order Cetacea?

Again, can we feel any certainty that *Orycteropus* has descended from the same stock as that whence the American Edentates descended? yet who would place it in a separate order?

Once more, it may well be that the *Artiodactyla* and *Perissodactyla* are entirely independent genetically beyond the fact that they are both Mammals; yet no one can deny that the *Ungulata* form a very natural group.

As to the fourth question—whether, namely, no common descendants should be classed in two different orders,—it seems reasonable that convenience should determine our practice. If the number of species of any one group is overwhelming, and if the complicated subdivisions of its families, subfamilies, and genera are very great, surely, then, convenience should determine us to subdivide them into two or even more orders.

Similarly as convenience may induce us to separate into distinct ordinal groups, so convenience may reasonably induce us to unite in one group forms which, whether descended from a common ancestor or not, undeniably constitute a well-defined and convenient aggregation.

As has been said, it may be that the characters which unite the *Artiodactyla* with the *Perissodactyla* are merely adaptive functional

ones, and that the two groups are no more genetically united to each other than is either one of them to the *Carnivora* or *Cheiroptera*. But even if this is not the case, and if both groups really are the descendants of some special but remote common ancestor, nevertheless the number of subdivisions necessary to classify the *Artiodactyla* is so great as possibly to justify, on that ground, the elevation of that group to the rank of a distinct order. As to the question respecting the zoological value of the *Lemuroidea*, there can, I think, be no doubt that Man, Apes, and Half-Apes together constitute a group capable of convenient and very distinct zoological definition.

The group may be thus defined: *Unguiculate claviculate placental mammals, with orbits encircled by bone; three kinds of teeth, at least at one time of life; brain always with a posterior lobe and calcarine fissure; the innermost digits of at least one pair of extremities opposable; hallux with a flat nail or none; a well-developed cæcum; penis pendulous; testes scrotal; always two pectoral mammæ.*

The group thus characterized, is sharply marked off from every other order of Mammals, while its common characters are sufficiently numerous and important to make a coherent whole in spite of the diversity existing between the two subordinal sections into which it is divided.

Moreover the number of forms contained in the order is not excessive, nor is the amount of subdivision requisite for classification great.

We may now turn to the subdivisions of the order, and seek answers to the three following questions:—1. What are the characters separating the *Lemuroidea* from the *Anthropoidea*? 2. What is the value of the characters which define subordinate groups of *Primates*? 3. What is the more prudent course as to the classification of such forms as may seem to be probably or possibly distinct in their origin?

The characters which divide the *Lemuroidea* from the *Anthropoidea* are as follows:—

1. Orbit opening widely into the temporal fossa.
2. Lachrymal foramen on the cheek.
3. Cerebellum much uncovered.
4. Posterior cornu of lateral ventricle very small.
5. Pollex always large.
6. Index of foot with a sharp claw.
7. Posterior cornua of os hyoides shorter than the anterior cornua.
8. Clitoris perforated by the urethra.
9. Uterus two-horned.
10. Placenta bell-shaped, diffuse, and non-deciduate.
11. Allantois very large.

The more important of these characters have already been reviewed, and reasons have been advanced tending to show the uncertainty which hangs over them as to the question of their adaptive or genetic nature.

With regard to the clitoris, which offers so appparently striking a

difference, it should be remembered that amongst Apes we find in *Ateles* an extraordinary elongation of that organ, while no naturalist would think of separating from the orders *Insectivora* and *Rodentia* such forms as *Talpa*, *Arvicola*, *Lagostomus*, and *Bathyergus* because in them this structure is, as in the Lemuroids, perforated by the urethra.

Nevertheless whatever objections may be made to the above distinctive characters taken one by one, it is not, I think, to be contested that, taken together, they render it in the highest degree improbable that the Lemuroids and Apes took origin from any common root-form not equally a progenitor of other Mammalian orders. Consequently, if genetic affinity is to be our standard, the *Lemuroidea* should rank as a distinct order. Considerations, however, have been already advanced against the adoption of such a standard; and yet other reasons will, I think, become obvious from a consideration of minor groups.

As to the second question then, namely the value of the characters which define subordinate groups, it may be well to compare together the *Simiadæ* and *Cebidæ*.

If the difference as to the development of the pollex in Lemuroids and Apes is of weight, why is not as much weight to be attached to the entirely different character of that organ in the two great groups of Apes?

If the dental distinctions between Lemuroids and Apes are to be considered to tell against genetic affinity, why should not the combined diminution of molars and augmentation of premolars so tell also in *Hapale*?

If an oblique ridge on the grinding-teeth can arise independently in *Galago* and *Ateles*, why may it not arise independently in *Ateles* and *Simia*?

If the absence in one case of a postorbital extension of the alisphenoid and malar counts against the common origin of *Lemur* and *Cynocephalus*, why should not the absence of a bony *meatus auditorius externus* in *Mycetes* also count against its affinity to *Cynocephalus* also?

If the greater relative size of the anterior hyoidean cornua is a bar to the assignment of a common origin between *Galago* and *Colobus*, why should not the presence of a jointed anterior cornu in *Lagothrix* form a bar to the assignment of a common origin to that Ape and to *Colobus*?

I must confess that I find it exceedingly difficult to conceive that the universal presence of a long bony *meatus auditorius externus* in the *Simiadæ* and its equally universal absence in the *Cebidæ* can be accounted for any exigences of the struggle for life upon incipient or primordial Ape-forms.

To this character must be added the many others which divide the Apes of the two hemispheres, namely:—(1) their different dentition; (2) the broad nasal septum of the New-World Apes; (3) the tendency of the *Cebidæ* to a curled tail-end, and the constant absence of any manifestation of such a tendency in the *Simiadæ*; (4) the

tendency of the *Simiadæ* to develop cheek-pouches and ischiatic callosities, and the constant absence of any manifestation of such tendencies in the *Cebidæ*; (5) the different general form and habit which the two groups present.

All these characters taken together seem to me to make it highly probable that the *Cebidæ* and *Simiadæ* are no diverging offshoots from some common Ape-parent, but that they have arisen in an independence as complete as that between the origin of either of them and the origin of the Lemuroids or Carnivores.

I need hardly add that I do not consider that such a fact of origin, could it be proved, would constitute any valid reason for raising the two Ape-groups into two distinct orders.

Those, however, who take this view as to their origin, and who, at the same time, would make the Lemuroids an order *on genetic grounds*, should be logically compelled to take the same step with regard to the *Simiadæ* and *Cebidæ*.

It will be asked, But can it be possible that two genera which possess so many points in common as *Cebus* and *Cercopithecus* have come to resemble each other independently?

I confess, I cannot see any reason why they should not have so come. We have abundant examples of separate points of resemblance which have independently arisen. Amongst such may be mentioned the flying Squirrels and the flying Phalangers; the canines and premolars of *Canis* and *Thylacinus*, the grinders of *Perameles* and *Urotrichus*, and, as before mentioned, the cervical vertebræ of *Auchenia* and *Myrmecophaga*.

As to the extremities, *Didelphys* and *Phalangista*, and, according to many, the *Lemuroids* also, show how an opposable inner digit may exist independently of inheritance.

But if some naturalists are disposed to admit that the common origin of the *Cebidæ* and *Simiadæ* may be very doubtful, can they be even sure that *Cercopithecus* and *Hylobates* can claim a common Ape-ancestor?

In proposing these questions I am far from venturing to positively affirm the genetic distinctness of different Apes; my object is to obtain a decision as to the third question—namely, what is the more prudent course to follow as to the classification of such forms as may seem to be probably or possibly distinct in their origin?

I would urge that the more prudent course is to give to genetic considerations a decidedly subordinate place in questions of classification—and this on two grounds.

If any two groups of animals can easily be joined together in a larger aggregation capable of distinct definition by numerous characters, easily discernible and drawn from structures important in the economy of life, then I submit such groups should be so joined, provided they do not constitute a whole inconvenient and unmanageable from the number of its subdivisions.

As to the *Cebidæ* and *Simiadæ*, then, I say, if they are really one in origin, it is not on *that* account they should be kept united in the same order; and, similarly, if the *Anthropoidea* and *Lemuroidea*

are really two in origin, it is not on *that* account they should be divided into two orders, but for convenience, should convenience demand it.

A judicious scepticism seems to me to be somewhat needed at the present moment. The considerations here advanced are by no means intended to support the assertion that views as to genetic affinity are mere dreams. Far from so believing, I conceive the theory of evolution to be probably true; and if so, real genetic affinity must exist, and when it can be securely detected must be most important. But the response of organization to need being such as it is (structure and function manifesting themselves so simultaneously), the discrimination between genetic and adaptive families must long, if not ever, continue a work of extreme delicacy and difficulty. The hasty way in which a few detected (often superficial) resemblances have of late, from time to time, been made to do duty as sufficient evidence of affinity and descent, seems to me to be unscientific as well as unphilosophical.

If, as I believe, so many similar forms have arisen in mutual independence, then the affinities of the animal kingdom, or even of the Mammalian class, can never be represented by the symbol of a tree. Rather, I believe, we should conceive the existence of a grove of trees, closely approximated, greatly differing in age and size, with their branches interlaced in a most complex entanglement.

On this view, the classification of existing and extinct animals can never, at any future time, be constructed on a purely genetic basis; but surely it need not therefore be a merely arbitrary and artificial system. If we find that a group of animals can be defined not by one character, but by the coexistence of numerous specialities of structure, such group must certainly be deemed a natural one, since order pervades the organic as well as the inorganic kingdoms of nature.

We can grasp the idea of "serial homology," and understand what is a "homotype;" and though homotypes *as such* have only a mental existence, the characters whence the conception is derived are actual real existences.

So with a species, a genus, a family, or an order, though these entities exist *as such* only in the mind, the phenomena whence we derive such conceptions exist actually *in rerum natura*.

It does not follow, therefore, that zoological groups need repose upon no philosophical conception if they cannot rest upon a genetic one. The group *Primates* can, as has been said, be clearly defined and distinctly conceived, however few or many may have been its sources of origin.

I venture, then, still to maintain that the order Primates is a natural, definite, and convenient one, and that, to say the least, it would be a questionable step to raise to a higher value that which I think may be best designated as the *suborder* LEMUROIDEA.

3. On some Venezuelan Birds collected by Mr. James M. Spence. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.Z.S.

[Received April 30, 1873.]

Mr. James M. Spence, F.R.G.S., of Manchester, has been kind enough to submit to our examination a large collection of birds, partly made by himself during a recent visit to Venezuela, and partly obtained from a collector resident at Caraccas.

The collection contains 23 mounted and over 300 unmounted skins, referable to about 250 species. Only two of these prove to be absolutely new to us; but there are several others of sufficient interest to induce us to offer to the Society the following notes on them.

1. Turdus olivater (Lafr.); Sclater, P. Z. S. 1859, p. 333.

Mr. Spence's collection contains a single skin of this species, which, so far as we at present know, is confined to the neighbourhood of Caraccas.

2. Lochmias sororia, sp. nov.

Similis L. nematuræ, *ex Brasilia, sed paulo major, superciliis albis nullis, et maculis corporis inferioribus minoribus et magis elongatis*: *long. tota* 6·2, *alæ* 3, *caudæ* 1·7, *tarsi* 1.

Hab. Venezuela (*Spence*).

This is a northern representative of *L. nematura* of the wood-region of Brazil, and is closely allied to that species, although easily recognizable by the characters above given.

3. Coccyzus landsbergi, Bp. Consp. i. p. 112; Sclater, P. Z. S. 1870, p. 169.

A single skin of this rare Cuckoo in the collection is the only example we have met with besides one in the British Museum (mentioned P. Z. S. 1870, p. 169). The species appears to be restricted to Venezuela and the northern coast of Columbia.

4. Micrastur zonothorax (Cab.).

Mr. Spence brings us a fine adult specimen of this northern form of *M. ruficollis*, which agrees in every way with the points of distinction pointed out by Dr. Cabanis*. We had previously only seen immature examples†.

5. Ardea herodias, Linn.

The occurrence of this northern species so far south as Venezuela is a novelty to us. The most prevalent species in South America is *Ardea cocoi*, which extends into Guiana (Schomb. Guian. iii. p. 752). But *A. herodias* occurs in the Antilles and in the Galapagos (Scl. & Salv. P. Z. S. 1870, p. 323).

* Journ. f. Orn. 1865, p. 406.

† *Cf.* P. Z. S. 1866, pp. 254, 356.

6. Porzana levraudi, Scl. & Salv. P. Z. S. 1868, p. 452, pl. xxxv.

This is the only specimen of this distinct species we have met with, except the specimens in the Paris Museum, from which our description was taken. The bird may be distinguished at once from the allied *P. cayennensis* by the absence of the red crown and by the white throat and median line below.

7. Porzana erythrops, Sclater, P. Z. S. 1867, p. 343, t. 21; Scl. & Salv. P. Z. S. 1868, p. 457.

We are glad to get a Venezuelan specimen of this fine species, as it serves to confirm our notion (hesitatingly expressed, P. Z. S. 1868, p. 458) that Schlegel's *Porzana schomburgki* is referable to this species and not to *Crex schomburgki* of Cabanis.

8. Crypturus cerviniventris, sp. nov.

Supra fuscescenti-cervinus fere unicolor, pileo obscuriore fere nigricante: subtus cervinus, in pectore saturatior, in ventre medio dilutior et albicantior: gula pallide cinerea: ventre imo tibiis et caudæ tectricibus inferioribus nigro undulatis: tectricibus alarum inferioribus albis; campterio intus obscure cinereo: remigibus intus pure cinereis, horum quarto quinto et sexto fere æqualibus et longissimis: rostro flavido, pedibus fuscescenti-corylinis: long. tota 10, *alæ* 5·8, *caudæ* 2.

Hab. Venezuela (*Spence*).

Obs. Affinis *C. tataupæ*, sed pectore cervino et alis longioribus, necnon colore dorsi flavicantiore distinguendus.

There is unfortunately only a single and not very perfect skin of this Tinamou in Mr. Spence's collection. But it appears to belong to a species intermediate in size and coloration between *C. obsoletus* and *C. tataupa*. It is rather larger than the latter, but considerably smaller than the former species.

Bonaparte has described a *Crypturus cervinus* as an ally of *C. tataupa* (C. R. xlii. p. 954); but if the short characters given are correct, his species must be quite different from the present bird.

In concluding these remarks, we must not fail to acknowledge Mr. Spence's liberality in allowing us to select the specimens above noticed and other valuable skins from his collection.

4. On the White Stork of Japan.

By R. Swinhoe, H.B.M. Consul (China Service).

[Received May 5, 1873.]

The grounds of the British Consulate at this port (Shanghai) were long graced by the presence of a pair of the handsome Mantchurian Crane (*Grus viridirostris*, Vieill.). These bred the year before last, producing two eggs; but only one bird was reared successfully. One of the parents then died, and its place was supplied by the adolescent offspring. At length an accident proved fatal to the

second parent, and the young bird remained alone and solitary. Mr. R. H. Boyce, chief of H.M. Office of Works here, being on a visit to Japan, brought from Yokohama a pair of large birds, which he thought would be fitting companions to the last of the Cranes. It was soon found that the new birds were of much coarser habits, required a daily supply of fish, and took no friendly notice of the more graceful Crane, from whom they kept aloof. The birds were not considered ornamental, and the Consul desired that they should be removed. Mr. Boyce wrote to me at Ningpo, and offered them to me. I was too glad to accept what I supposed from the description were Cranes of some species or other, and intended them at once for the Society's Gardens. Imagine my delight on arriving here to find that instead of Cranes we had a form of White Stork quite distinct from any thing yet known. It has characters in common with *Ciconia alba* of Europe, but seems to lean more towards *C. maguari*, Temm., of America. I will do my best to paint this novelty as it stands before me; but without being able to handle it it is impossible to give correct details as to either measurements or markings. In the first place I think no objection can be made to calling the species by the name of the gentleman who has brought the bird to notice. I will therefore head my description with the title :—

Ciconia boyciana, sp. nov. (Boyce's Stork.)

The male stands about 3 feet 10 inches in height, and about 4 inches higher than the female—which resembles him in colour, but is in every way smaller, has a shorter bill, and shorter and thinner legs. It is not unusual for them in reposing attitude, with crouched head and neck, and bill buried in the long neck-feathers, to stand each on one leg close together, the female a little turned towards the male, so that her head comes under the chin of the male without touching it. Bill horn-black, paler at tip, between 10 and 11 inches long, and nearly 2 inches deep at base, culmen straight, gonys ascending, mandibles slightly gaping (especially in the male); rictus, under edge of crura, and intercrural skin lake red, throat-feathers advancing to an acute angle between. Iris cream-white, with black exterior circle; a nictitating membrane from fore edge of the eye occasionally covers over the eye. Eyelids and bare skin round eye, bare space in front of eye about $\frac{3}{4}$ inch long towards beak and about $\frac{1}{2}$ inch deep, and angle behind eye vermilion-red. Legs and feet dull vermilion. Feathers of the front neck long, narrow, and loose, webbed at margins. Tail white. Primary quills brownish black, dingy white on their outer webs, bordered with black; secondaries and tertiaries black, the latter broad and long, extending 3 inches beyond the tail, iridescent with purple. The rest of the bird pure white.

From the above description it will be seen that this Stork is quite distinct from the two known White Storks. Our birds were not heard to utter any cry, but often chattered their bills together as Storks usually do. They were very tame and are now on their way to London in the steamer 'Priam.' They have thriven long in